

196219.ST25.txt
SEQUENCE LISTING

<110> May, Gregory
Baszczynski, Christopher
Zhu, Tong
Kipp, Peter
Mahajan, Pramod

<120> PLANT MSH2 SEQUENCES AND METHODS OF USE

<130> 5839-2 (035839/196219)

<160> 42

<170> PatentIn version 3.0

<210> 1

<211> 3033

<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

<222> (22)..(2838)

<400> 1

ataaagggtta aagaaaaaaa a atg aat gaa aat ttg gag gaa cag agc aag
51

Met Asn Glu Asn Leu Glu Glu Gln Ser Lys
1 5 10

ctt ccc gag ctt aaa ctg gat gct aag caa gct caa gga ttt ctc tca
99

Leu Pro Glu Leu Lys Leu Asp Ala Lys Gln Ala Gln Gly Phe Leu Ser
15 20 25

ttc ttc aaa acc ctg ccc aag gac cct agg gca gtt cgc ctc ttt gat
147

Phe Phe Lys Thr Leu Pro Lys Asp Pro Arg Ala Val Arg Leu Phe Asp
30 35 40

cgt cgg gac tat tat aca tct cat gga gat gat gca act ttc att gca
195

Arg Arg Asp Tyr Tyr Thr Ser His Gly Asp Asp Ala Thr Phe Ile Ala
45 50 55

gag aca tat tac cac aca aca act gcg tta cga cag ttg ggt aat aga
243

Glu Thr Tyr Tyr His Thr Thr Thr Ala Leu Arg Gln Leu Gly Asn Arg
60 65 70

gct gat gcc ctt tcc agt gtt agt gtg agt aga aac atg ttt gaa aca
291

Ala Asp Ala Leu Ser Ser Val Ser Val Ser Arg Asn Met Phe Glu Thr
75 80 85 90

ata gct cgt gac att ctc ttg gag aga atg gac cgt act ctt gaa cta
339

Ile Ala Arg Asp Ile Leu Leu Glu Arg Met Asp Arg Thr Leu Glu Leu

tat gag ggc agt ggt tca aac tgg aga ctg gta aaa agt gga acc cca
387

Tyr Glu Gly Ser Gly Ser Asn Trp Arg Leu Val Lys Ser Gly Thr Pro
110 115 120

ggg aat ctt gga agt ttt gag gat att ctg ttt gct aat aat gaa atg
435

Gly Asn Leu Gly Ser Phe Glu Asp Ile Leu Phe Ala Asn Asn Glu Met
125 130 135

caa aat tct ccg gtg att gct gct ctt gct cca aac ttc ggt cag aat
483

Gln Asn Ser Pro Val Ile Ala Ala Leu Ala Pro Asn Phe Gly Gln Asn
140 145 150

gga tgt gaa gtt ggc tta ggc tat gtt gat att act aag aga gtc ctt
531

Gly Cys Glu Val Gly Leu Gly Tyr Val Asp Ile Thr Lys Arg Val Leu
155 160 165 170

ggt tta aca gaa ttt cta gat gat agc cac ttc aca aat ttg gag tct
579

Gly Leu Thr Glu Phe Leu Asp Asp Ser His Phe Thr Asn Leu Glu Ser
175 180 185

gct ttg gtt gct ctt ggt tgc aga gaa tgt ctt gta cca gcg gag act
627

Ala Leu Val Ala Leu Gly Cys Arg Glu Cys Leu Val Pro Ala Glu Thr
190 195 200

ggc aaa tcc agt gaa tac agg cct atg ttt gat gca ata tct aga tgc
675

Gly Lys Ser Ser Glu Tyr Arg Pro Met Phe Asp Ala Ile Ser Arg Cys
205 210 215

ggc gtg atg gta act gaa aga aag aaa act gaa ttt aaa ggg aga gat
723

Gly Val Met Val Thr Glu Arg Lys Lys Thr Glu Phe Lys Gly Arg Asp
220 225 230

ttg gta cag gat ctt ggt agg ctc gtc aag ggt tca gta gaa cct gtt
771

Leu Val Gln Asp Leu Gly Arg Leu Val Lys Gly Ser Val Glu Pro Val
235 240 245 250

cga gat ttg gtc tct ggg ttc gaa tgt gca tca ggc gct ttg ggg tgc
819

Arg Asp Leu Val Ser Gly Phe Glu Cys Ala Ser Gly Ala Leu Gly Cys
255 260 265

ata ctt tct tat gca gaa cta ctt gcg gat gag agc aac tat gga aac
867

Ile Leu Ser Tyr Ala Glu Leu Leu Ala Asp Glu Ser Asn Tyr Gly Asn
270 275 280

tat aca gtc aaa caa tac aac ctc aat agt tac atg aga tta gat tct
915

196219.ST25.txt

Tyr Thr Val Lys Gln Tyr Asn Leu Asn Ser Tyr Met Arg Leu Asp Ser
 285 290 295
 gct gct atg aga gca ctg aat gtt atg gag agc aaa tca gat gct aat
 963
 Ala Ala Met Arg Ala Leu Asn Val Met Glu Ser Lys Ser Asp Ala Asn
 300 305 310
 aaa aat ttt agc ttg ttc ggt ctg atg aat aga acg tgt act gct gga
 1011
 Lys Asn Phe Ser Leu Phe Gly Leu Met Asn Arg Thr Cys Thr Ala Gly
 315 320 325 330
 atg ggt aaa agg tta ttg cac atg tgg ctg aag caa cct tta cta gat
 1059
 Met Gly Lys Arg Leu Leu His Met Trp Leu Lys Gln Pro Leu Leu Asp
 335 340 345
 gta gaa gag att aac tgt agg ctg gat tta gtt caa tca ttc gtg gag
 1107
 Val Glu Glu Ile Asn Cys Arg Leu Asp Leu Val Gln Ser Phe Val Glu
 350 355 360
 gat gct gcg ctt cgc caa gat ttg agg cag cat ctg aaa aga att tca
 1155
 Asp Ala Ala Leu Arg Gln Asp Leu Arg Gln His Leu Lys Arg Ile Ser
 365 370 375
 gat att gag cgg ctg aca cac aat ctt gag agg aaa aga gcc agt tta
 1203
 Asp Ile Glu Arg Leu Thr His Asn Leu Glu Arg Lys Arg Ala Ser Leu
 380 385 390
 gtg cac gtt gta aaa ctc tat cag tca agt acc aga gta cca tat atc
 1251
 Val His Val Val Lys Leu Tyr Gln Ser Ser Thr Arg Val Pro Tyr Ile
 395 400 405 410
 aaa agt gtt ttg gaa cgt cat gat ggg caa ttt gca aca ctc atc agg
 1299
 Lys Ser Val Leu Glu Arg His Asp Gly Gln Phe Ala Thr Leu Ile Arg
 415 420 425
 gaa agg tat att gat tct cta gag aaa tgg agt gat gat aat cac ctg
 1347
 Glu Arg Tyr Ile Asp Ser Leu Glu Lys Trp Ser Asp Asp Asn His Leu
 430 435 440
 aat aag ttc ata ggt ctt gtg gaa act tct gtt gac ctt gat caa ctt
 1395
 Asn Lys Phe Ile Gly Leu Val Glu Thr Ser Val Asp Leu Asp Gln Leu
 445 450 455
 gag aat gga gaa tac atg att tct tct gca tat gac cca aat tta tct
 1443
 Glu Asn Gly Glu Tyr Met Ile Ser Ser Ala Tyr Asp Pro Asn Leu Ser
 460 465 470
 gct ctg aag gat gag caa gag aca ttg gag cga caa att cat aat ttg

1491

Ala Leu Lys Asp Glu Gln Glu Thr Leu Glu Arg Gln Ile His Asn Leu
475 480 485 490

cac aaa caa act gcc aat gat ctt gat cta cct att gat aag tca ctt
1539

His Lys Gln Thr Ala Asn Asp Leu Asp Leu Pro Ile Asp Lys Ser Leu
495 500 505

aaa cta gat aaa gaa aca caa ttt gga cac gtc ttc aga att acc aag
1587

Lys Leu Asp Lys Glu Thr Gln Phe Gly His Val Phe Arg Ile Thr Lys
510 515 520

aaa gaa gaa cca aaa gtc agg aag cag cta aat tct cac tac att gtt
1635

Lys Glu Glu Pro Lys Val Arg Lys Gln Leu Asn Ser His Tyr Ile Val
525 530 535

ctc gaa aca cgt aag gat ggg gta aag ttc acc tat aca aaa ctc aaa
1683

Leu Glu Thr Arg Lys Asp Gly Val Lys Phe Thr Tyr Thr Lys Leu Lys
540 545 550

aaa cta gga gat cag ttc cag aag att gta gag gag tac aaa agc tgt
1731

Lys Leu Gly Asp Gln Phe Gln Lys Ile Val Glu Glu Tyr Lys Ser Cys
555 560 565 570

cag aaa gaa ttg gta gct cgt gta gtt caa aca gct gcg agt ttc tcc
1779

Gln Lys Glu Leu Val Ala Arg Val Val Gln Thr Ala Ala Ser Phe Ser
575 580 585

gag gtg ttt gca ggt ata gct ggt gta ctt gct gag ttg gat gtg tta
1827

Glu Val Phe Ala Gly Ile Ala Gly Val Leu Ala Glu Leu Asp Val Leu
590 595 600

ctg agt ttt gcg gat ttg gct gcc agt tgc cca act ccc tac aca aga
1875

Leu Ser Phe Ala Asp Leu Ala Ala Ser Cys Pro Thr Pro Tyr Thr Arg
605 610 615

cca aat atc agt cca cca gat aca gga gat att ata ctt gaa ggg tgt
1923

Pro Asn Ile Ser Pro Pro Asp Thr Gly Asp Ile Ile Leu Glu Gly Cys
620 625 630

agg cat cct tgt gtg gaa gct caa gat tgg gtt aac tcc att cct aat
1971

Arg His Pro Cys Val Glu Ala Gln Asp Trp Val Asn Ser Ile Pro Asn
635 640 645 650

gac tgt aga cta gtt agg gga gag agt tgg ttt cag att atc aca ggc
2019

Asp Cys Arg Leu Val Arg Gly Glu Ser Trp Phe Gln Ile Ile Thr Gly
655 660 665

196219.ST25.txt

cct aac atg ggt gga aag tcg acc tac att cgg cag gtt ggt gtg aat
2067

Pro Asn Met Gly Gly Lys Ser Thr Tyr Ile Arg Gln Val Gly Val Asn
670 675 680

gtc ctg atg gcc caa gtt ggc tcg ttt gtt cca tgt gac aat gct acc
2115

Val Leu Met Ala Gln Val Gly Ser Phe Val Pro Cys Asp Asn Ala Thr
685 690 695

att tct att cgt gat tgt att ttt gct cgt gtt ggc gct gga gat tgc
2163

Ile Ser Ile Arg Asp Cys Ile Phe Ala Arg Val Gly Ala Gly Asp Cys
700 705 710

cag ctg aga gga gtt tct act ttt atg caa gag atg ctt gag act gca
2211

Gln Leu Arg Gly Val Ser Thr Phe Met Gln Glu Met Leu Glu Thr Ala
715 720 725 730

tcg atc ttg aaa gga gct act gat aga tca ttg att ata att gat gag
2259

Ser Ile Leu Lys Gly Ala Thr Asp Arg Ser Leu Ile Ile Ile Asp Glu
735 740 745

ttg ggc cgt ggg aca tca acc tac gat ggc ttt ggt tta gct tgg gct
2307

Leu Gly Arg Gly Thr Ser Thr Tyr Asp Gly Phe Gly Leu Ala Trp Ala
750 755 760

att tgt gag cac att gtt gaa gaa att aaa gca cca aca ttg ttt gcc
2355

Ile Cys Glu His Ile Val Glu Glu Ile Lys Ala Pro Thr Leu Phe Ala
765 770 775

act cac ttt cat gag ctg act gca tta gcc aac aag aat gga gac aat
2403

Thr His Phe His Glu Leu Thr Ala Leu Ala Asn Lys Asn Gly Asp Asn
780 785 790

gga cat aag aaa aat gct ggg ata gca aat ttt cat gtt ttt gca cac
2451

Gly His Lys Lys Asn Ala Gly Ile Ala Asn Phe His Val Phe Ala His
795 800 805 810

att gac cct tct aat cgc aag cta act atg ctt tac aag gtt cac cca
2499

Ile Asp Pro Ser Asn Arg Lys Leu Thr Met Leu Tyr Lys Val His Pro
815 820 825

ggc gct tgt gat cag agt ttt ggt att cat gtt gct gaa ttt gca aat
2547

Gly Ala Cys Asp Gln Ser Phe Gly Ile His Val Ala Glu Phe Ala Asn
830 835 840

ttt cca ccg agt gtt gtg gct ctg gct aga gaa aag gca tct gag ttg
2595

Phe Pro Pro Ser Val Val Ala Leu Ala Arg Glu Lys Ala Ser Glu Leu
845 850 855

gag gat ttc tct cct att gcc ata att cca aat gac att aaa gag gca
2643

Glu Asp Phe Ser Pro Ile Ala Ile Ile Pro Asn Asp Ile Lys Glu Ala
860 865 870

gct tca aaa cgg aag aga gaa ttt gac cgc cat gac gtg tct aga ggt
2691

Ala Ser Lys Arg Lys Arg Glu Phe Asp Arg His Asp Val Ser Arg Gly
875 880 885 890

act gcc aga gct cgg caa ttc tta cag gat ttc gct cag ttg cca ctg
2739

Thr Ala Arg Ala Arg Gln Phe Leu Gln Asp Phe Ala Gln Leu Pro Leu
895 900 905

gat aag atg gat cca aac gtg gtc agg caa aag ttg agc aaa atg aaa
2787

Asp Lys Met Asp Pro Asn Val Val Arg Gln Lys Leu Ser Lys Met Lys
910 915 920

acc gac ctg gag agg gat gca gtt gac tct cac tgg ctt cag caa ttc
2835

Thr Asp Leu Glu Arg Asp Ala Val Asp Ser His Trp Leu Gln Gln Phe
925 930 935

ttt taattcttca gattagaact atcttctatt ctgtgaagct tgggggggaa
2888

Phe

tgatacttat ggggtttgtg gatataactt agcctatctg taaactttca tttaaactct
2948

taccccaaac atgattctct gtaatcaggg gacttttgta tgcattctgt gttaatagta
3008

agcgttatct tatatggtca aaaaa
3033

<210> 2

<211> 939

<212> PRT

<213> Nicotiana tabacum

<400> 2

Met Asn Glu Asn Leu Glu Glu Gln Ser Lys Leu Pro Glu Leu Lys Leu
1 5 10 15

Asp Ala Lys Gln Ala Gln Gly Phe Leu Ser Phe Phe Lys Thr Leu Pro
20 25 30

Lys Asp Pro Arg Ala Val Arg Leu Phe Asp Arg Arg Asp Tyr Tyr Thr
35 40 45

196219.ST25.txt

```

Ser His Gly Asp Asp Ala Thr Phe Ile Ala Glu Thr Tyr Tyr His Thr
 50                               55                               60

Thr Thr Ala Leu Arg Gln Leu Gly Asn Arg Ala Asp Ala Leu Ser Ser
65                               70                               75                               80

Val Ser Val Ser Arg Asn Met Phe Glu Thr Ile Ala Arg Asp Ile Leu
                               85                               90                               95

Leu Glu Arg Met Asp Arg Thr Leu Glu Leu Tyr Glu Gly Ser Gly Ser
                               100                               105                               110

Asn Trp Arg Leu Val Lys Ser Gly Thr Pro Gly Asn Leu Gly Ser Phe
                               115                               120                               125

Glu Asp Ile Leu Phe Ala Asn Asn Glu Met Gln Asn Ser Pro Val Ile
130                               135                               140

Ala Ala Leu Ala Pro Asn Phe Gly Gln Asn Gly Cys Glu Val Gly Leu
145                               150                               155                               160

Gly Tyr Val Asp Ile Thr Lys Arg Val Leu Gly Leu Thr Glu Phe Leu
                               165                               170                               175

Asp Asp Ser His Phe Thr Asn Leu Glu Ser Ala Leu Val Ala Leu Gly
                               180                               185                               190

Cys Arg Glu Cys Leu Val Pro Ala Glu Thr Gly Lys Ser Ser Glu Tyr
195                               200                               205

Arg Pro Met Phe Asp Ala Ile Ser Arg Cys Gly Val Met Val Thr Glu
210                               215                               220

Arg Lys Lys Thr Glu Phe Lys Gly Arg Asp Leu Val Gln Asp Leu Gly
225                               230                               235                               240

Arg Leu Val Lys Gly Ser Val Glu Pro Val Arg Asp Leu Val Ser Gly
245                               250                               255

Phe Glu Cys Ala Ser Gly Ala Leu Gly Cys Ile Leu Ser Tyr Ala Glu
260                               265                               270

Leu Leu Ala Asp Glu Ser Asn Tyr Gly Asn Tyr Thr Val Lys Gln Tyr
275                               280                               285

```

Asn Leu Asn Ser Tyr Met Arg Leu Asp Ser Ala Ala Met Arg Ala Leu
290 295 300

Asn Val Met Glu Ser Lys Ser Asp Ala Asn Lys Asn Phe Ser Leu Phe
305 310 315 320

Gly Leu Met Asn Arg Thr Cys Thr Ala Gly Met Gly Lys Arg Leu Leu
325 330 335

His Met Trp Leu Lys Gln Pro Leu Leu Asp Val Glu Glu Ile Asn Cys
340 345 350

Arg Leu Asp Leu Val Gln Ser Phe Val Glu Asp Ala Ala Leu Arg Gln
355 360 365

Asp Leu Arg Gln His Leu Lys Arg Ile Ser Asp Ile Glu Arg Leu Thr
370 375 380

His Asn Leu Glu Arg Lys Arg Ala Ser Leu Val His Val Val Lys Leu
385 390 395 400

Tyr Gln Ser Ser Thr Arg Val Pro Tyr Ile Lys Ser Val Leu Glu Arg
405 410 415

His Asp Gly Gln Phe Ala Thr Leu Ile Arg Glu Arg Tyr Ile Asp Ser
420 425 430

Leu Glu Lys Trp Ser Asp Asp Asn His Leu Asn Lys Phe Ile Gly Leu
435 440 445

Val Glu Thr Ser Val Asp Leu Asp Gln Leu Glu Asn Gly Glu Tyr Met
450 455 460

Ile Ser Ser Ala Tyr Asp Pro Asn Leu Ser Ala Leu Lys Asp Glu Gln
465 470 475 480

Glu Thr Leu Glu Arg Gln Ile His Asn Leu His Lys Gln Thr Ala Asn
485 490 495

Asp Leu Asp Leu Pro Ile Asp Lys Ser Leu Lys Leu Asp Lys Glu Thr
500 505 510

Gln Phe Gly His Val Phe Arg Ile Thr Lys Lys Glu Glu Pro Lys Val
Page 8

515

520

525

Arg Lys Gln Leu Asn Ser His Tyr Ile Val Leu Glu Thr Arg Lys Asp
 530 535 540

Gly Val Lys Phe Thr Tyr Thr Lys Leu Lys Lys Leu Gly Asp Gln Phe
 545 550 555 560

Gln Lys Ile Val Glu Glu Tyr Lys Ser Cys Gln Lys Glu Leu Val Ala
 565 570 575

Arg Val Val Gln Thr Ala Ala Ser Phe Ser Glu Val Phe Ala Gly Ile
 580 585 590

Ala Gly Val Leu Ala Glu Leu Asp Val Leu Leu Ser Phe Ala Asp Leu
 595 600 605

Ala Ala Ser Cys Pro Thr Pro Tyr Thr Arg Pro Asn Ile Ser Pro Pro
 610 615 620

Asp Thr Gly Asp Ile Ile Leu Glu Gly Cys Arg His Pro Cys Val Glu
 625 630 635 640

Ala Gln Asp Trp Val Asn Ser Ile Pro Asn Asp Cys Arg Leu Val Arg
 645 650 655

Gly Glu Ser Trp Phe Gln Ile Ile Thr Gly Pro Asn Met Gly Gly Lys
 660 665 670

Ser Thr Tyr Ile Arg Gln Val Gly Val Asn Val Leu Met Ala Gln Val
 675 680 685

Gly Ser Phe Val Pro Cys Asp Asn Ala Thr Ile Ser Ile Arg Asp Cys
 690 695 700

Ile Phe Ala Arg Val Gly Ala Gly Asp Cys Gln Leu Arg Gly Val Ser
 705 710 715 720

Thr Phe Met Gln Glu Met Leu Glu Thr Ala Ser Ile Leu Lys Gly Ala
 725 730 735

Thr Asp Arg Ser Leu Ile Ile Ile Asp Glu Leu Gly Arg Gly Thr Ser
 740 745 750

Thr Tyr Asp Gly Phe Gly Leu Ala Trp Ala Ile Cys Glu His Ile Val
 755 760 765

Glu Glu Ile Lys Ala Pro Thr Leu Phe Ala Thr His Phe His Glu Leu
 770 775 780

Thr Ala Leu Ala Asn Lys Asn Gly Asp Asn Gly His Lys Lys Asn Ala
 785 790 795 800

Gly Ile Ala Asn Phe His Val Phe Ala His Ile Asp Pro Ser Asn Arg
 805 810 815

Lys Leu Thr Met Leu Tyr Lys Val His Pro Gly Ala Cys Asp Gln Ser
 820 825 830

Phe Gly Ile His Val Ala Glu Phe Ala Asn Phe Pro Pro Ser Val Val
 835 840 845

Ala Leu Ala Arg Glu Lys Ala Ser Glu Leu Glu Asp Phe Ser Pro Ile
 850 855 860

Ala Ile Ile Pro Asn Asp Ile Lys Glu Ala Ala Ser Lys Arg Lys Arg
 865 870 875 880

Glu Phe Asp Arg His Asp Val Ser Arg Gly Thr Ala Arg Ala Arg Gln
 885 890 895

Phe Leu Gln Asp Phe Ala Gln Leu Pro Leu Asp Lys Met Asp Pro Asn
 900 905 910

Val Val Arg Gln Lys Leu Ser Lys Met Lys Thr Asp Leu Glu Arg Asp
 915 920 925

Ala Val Asp Ser His Trp Leu Gln Gln Phe Phe
 930 935

<210> 3
 <211> 3033
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> CDS
 <222> (22)..(2838)

<400> 3
 aaagttaaaa gaaaaaaaaa a atg aat gaa aat ttg gag gaa cag agc aag

51

Met Asn Glu Asn Leu Glu Glu Gln Ser Lys
1 5 10

ctt cct gag ctt aaa ctt gat gct aag caa gct caa gga ttt ctc tca
99

Leu Pro Glu Leu Lys Leu Asp Ala Lys Gln Ala Gln Gly Phe Leu Ser
15 20 25

ttt ttc aaa acc cta ccc aag gac cct agg gca gtt cgc ctc ttt gat
147

Phe Phe Lys Thr Leu Pro Lys Asp Pro Arg Ala Val Arg Leu Phe Asp
30 35 40

cgt cgg gac tat tat act gct cat gga gat gat gca act ttc att gca
195

Arg Arg Asp Tyr Tyr Thr Ala His Gly Asp Asp Ala Thr Phe Ile Ala
45 50 55

gag aca tat tac cac aca aca act gcg tta cga cag ttg ggt aat aga
243

Glu Thr Tyr Tyr His Thr Thr Thr Ala Leu Arg Gln Leu Gly Asn Arg
60 65 70

gct gat gcc ctt tcc agt gtt agt gtg agt aga aac atg ttt gaa aca
291

Ala Asp Ala Leu Ser Ser Val Ser Val Ser Arg Asn Met Phe Glu Thr
75 80 85 90

ata gct cgt gac att ctc ttg gag aga atg gac cgt act ctt gaa cta
339

Ile Ala Arg Asp Ile Leu Leu Glu Arg Met Asp Arg Thr Leu Glu Leu
95 100 105

tat gag ggc agt ggt tca aac tgg aga ctg gta aaa agt gga acc cca
387

Tyr Glu Gly Ser Gly Ser Asn Trp Arg Leu Val Lys Ser Gly Thr Pro
110 115 120

ggg aat ctt gga agt ttt gag gat att ctg ttt gct aat aat gaa atg
435

Gly Asn Leu Gly Ser Phe Glu Asp Ile Leu Phe Ala Asn Asn Glu Met
125 130 135

caa aat tct ccg gtg att gct gct ctt gct cca aac ttc ggt cag aat
483

Gln Asn Ser Pro Val Ile Ala Ala Leu Ala Pro Asn Phe Gly Gln Asn
140 145 150

gga tgt gaa gtt ggc tta ggc tat gtt gat att act aag aga gtc ctt
531

Gly Cys Glu Val Gly Leu Gly Tyr Val Asp Ile Thr Lys Arg Val Leu
155 160 165 170

ggt tta aca gaa ttt cta gat gat agc cac ttc aca aat ttg gag tct
579

Gly Leu Thr Glu Phe Leu Asp Asp Ser His Phe Thr Asn Leu Glu Ser
175 180 185

196219.ST25.txt

gct ttg gtt gct ctt ggt tgc aga gaa tgt ctt gta cca gcg gag act
627

Ala Leu Val Ala Leu Gly Cys Arg Glu Cys Leu Val Pro Ala Glu Thr
190 195 200

ggc aaa tcc agt gaa tac agg cct atg ttt gat gca ata tct aga tgc
675

Gly Lys Ser Ser Glu Tyr Arg Pro Met Phe Asp Ala Ile Ser Arg Cys
205 210 215

ggc gtg atg gta act gaa aga aag aaa act gaa ttt aaa ggg aga gat
723

Gly Val Met Val Thr Glu Arg Lys Lys Thr Glu Phe Lys Gly Arg Asp
220 225 230

ttg gta cag gat ctt ggt agg ctc gtc aag ggt tca gta gaa cct gtt
771

Leu Val Gln Asp Leu Gly Arg Leu Val Lys Gly Ser Val Glu Pro Val
235 240 245 250

cga gat ttg gtc tct ggg ttc gaa tgt gca tca ggc gct ttg ggg tgc
819

Arg Asp Leu Val Ser Gly Phe Glu Cys Ala Ser Gly Ala Leu Gly Cys
255 260 265

ata ctt tct tat gca gaa cta ctt gcg gat gag agc aac tat gga aac
867

Ile Leu Ser Tyr Ala Glu Leu Leu Ala Asp Glu Ser Asn Tyr Gly Asn
270 275 280

tat aca gtc aaa caa tac aac ctc aat agt tac atg aga tta gat tct
915

Tyr Thr Val Lys Gln Tyr Asn Leu Asn Ser Tyr Met Arg Leu Asp Ser
285 290 295

gct gct atg aga gca ctg aat gtt atg gag agc aaa tca gat gct aat
963

Ala Ala Met Arg Ala Leu Asn Val Met Glu Ser Lys Ser Asp Ala Asn
300 305 310

aaa aat ttt agc ttg ttc ggt ctg atg aat aga acg tgt act gct gga
1011

Lys Asn Phe Ser Leu Phe Gly Leu Met Asn Arg Thr Cys Thr Ala Gly
315 320 325 330

atg ggt aaa agg tta ttg cac atg tgg ctg aag caa cct tta cta gat
1059

Met Gly Lys Arg Leu Leu His Met Trp Leu Lys Gln Pro Leu Leu Asp
335 340 345

gta gaa gag att aac tgt agg ctg gat tta gtt caa tca ttc gtg gag
1107

Val Glu Glu Ile Asn Cys Arg Leu Asp Leu Val Gln Ser Phe Val Glu
350 355 360

gat gct gcg ctt cgc caa gat ttg agg cag cat ctg aaa aga att tca
1155

Asp Ala Ala Leu Arg Gln Asp Leu Arg Gln His Leu Lys Arg Ile Ser
365 370 375

gat att gag cgg ctg aca cac aat ctt gag agg aaa aga gcc agt tta
1203

Asp Ile Glu Arg Leu Thr His Asn Leu Glu Arg Lys Arg Ala Ser Leu
380 385 390

gtg cac gtt gta aaa ctc tat cag tca agt acc aga gta cca tat atc
1251

Val His Val Val Lys Leu Tyr Gln Ser Ser Thr Arg Val Pro Tyr Ile
395 400 405 410

aaa agt gtt ttg gaa cgt cat gat ggg caa ttt gca aca ctc atc agg
1299

Lys Ser Val Leu Glu Arg His Asp Gly Gln Phe Ala Thr Leu Ile Arg
415 420 425

gaa agg tat att gat tct cta gag aaa tgg agt gat gat aat cac ctg
1347

Glu Arg Tyr Ile Asp Ser Leu Glu Lys Trp Ser Asp Asp Asn His Leu
430 435 440

aat aag ttc ata ggt ctt gtg gaa act tct gtt gac ctt gat caa ctt
1395

Asn Lys Phe Ile Gly Leu Val Glu Thr Ser Val Asp Leu Asp Gln Leu
445 450 455

gag aat gga gaa tac atg att tct tct gca tat gac cca aat tta tct
1443

Glu Asn Gly Glu Tyr Met Ile Ser Ser Ala Tyr Asp Pro Asn Leu Ser
460 465 470

gct ctg aag gat gag caa gag aca ttg gag cga caa att cat aat ttg
1491

Ala Leu Lys Asp Glu Gln Glu Thr Leu Glu Arg Gln Ile His Asn Leu
475 480 485 490

cac aaa caa act gcc aat gat ctt gat cta cct att gat aag tca ctt
1539

His Lys Gln Thr Ala Asn Asp Leu Asp Leu Pro Ile Asp Lys Ser Leu
495 500 505

aaa cta gat aaa gaa aca caa ttt gga cac gtc ttc aga att acc aag
1587

Lys Leu Asp Lys Glu Thr Gln Phe Gly His Val Phe Arg Ile Thr Lys
510 515 520

aaa gaa gaa cca aaa gtc agg aag cag cta aat tct cac tac att gtt
1635

Lys Glu Glu Pro Lys Val Arg Lys Gln Leu Asn Ser His Tyr Ile Val
525 530 535

ctc gaa aca cgt aag gat ggg gta aag ttc acc tat aca aaa ctc aaa
1683

Leu Glu Thr Arg Lys Asp Gly Val Lys Phe Thr Tyr Thr Lys Leu Lys
540 545 550

aaa cta gga gat cag ttc cag aag att gta gag gag tac aaa agc tgt
1731

Lys Leu Gly Asp Gln Phe Gln Lys Ile Val Glu Glu Tyr Lys Ser Cys

555

560

565

570

cag aaa gaa ttg gta gct cgt gta gtt caa aca gct gcg agt ttc tcc
1779

Gln Lys Glu Leu Val Ala Arg Val Val Gln Thr Ala Ala Ser Phe Ser
575 580 585

gag gtg ttt gca ggt ata gct ggt gta ctt gct gag ttg gat gtg tta
1827

Glu Val Phe Ala Gly Ile Ala Gly Val Leu Ala Glu Leu Asp Val Leu
590 595 600

ctg agt ttt gcg gat ttg gct gcc agt tgc cca act ccc tac aca aga
1875

Leu Ser Phe Ala Asp Leu Ala Ala Ser Cys Pro Thr Pro Tyr Thr Arg
605 610 615

cca aat atc agt cca cca gat aca gga gat att ata ctt gaa ggg tgt
1923

Pro Asn Ile Ser Pro Pro Asp Thr Gly Asp Ile Ile Leu Glu Gly Cys
620 625 630

agg cat cct tgt gtg gaa gct caa gat tgg gtt aac tcc att cct aat
1971

Arg His Pro Cys Val Glu Ala Gln Asp Trp Val Asn Ser Ile Pro Asn
635 640 645 650

gac tgt aga cta gtt agg gga gag agt tgg ttt cag att atc aca ggc
2019

Asp Cys Arg Leu Val Arg Gly Glu Ser Trp Phe Gln Ile Ile Thr Gly
655 660 665

cct aac atg ggt gga aag tcg acc tac att cgg cag gtt ggt gtg aat
2067

Pro Asn Met Gly Gly Lys Ser Thr Tyr Ile Arg Gln Val Gly Val Asn
670 675 680

gtc ctg atg gcc caa gtt ggc tcg ttt gtt cca tgt gac aat gct acc
2115

Val Leu Met Ala Gln Val Gly Ser Phe Val Pro Cys Asp Asn Ala Thr
685 690 695

att tct att cgt gat tgt att ttt gct cgt gtt ggc gct gga gat tgc
2163

Ile Ser Ile Arg Asp Cys Ile Phe Ala Arg Val Gly Ala Gly Asp Cys
700 705 710

cag ctg aga gga gtt tct act ttt atg caa gag atg ctt gag act gca
2211

Gln Leu Arg Gly Val Ser Thr Phe Met Gln Glu Met Leu Glu Thr Ala
715 720 725 730

tcg atc ttg aaa gga gct act gat aga tca ttg att ata att gat gag
2259

Ser Ile Leu Lys Gly Ala Thr Asp Arg Ser Leu Ile Ile Ile Asp Glu
735 740 745

ttg ggc cgt ggg aca tca acc tac gat ggc ttt ggt tta gct tgg gct
2307

Leu Gly Arg Gly Thr Ser Thr Tyr Asp Gly Phe Gly Leu Ala Trp Ala
750 755 760

att tgt gag cac att gtt gaa gaa att aaa gca cca aca ttg ttt gcc
2355

Ile Cys Glu His Ile Val Glu Glu Ile Lys Ala Pro Thr Leu Phe Ala
765 770 775

act cac ttt cat gag ctg act gca tta gcc aac aag aat gga gac aat
2403

Thr His Phe His Glu Leu Thr Ala Leu Ala Asn Lys Asn Gly Asp Asn
780 785 790

gga cat aag aaa aat gct ggg ata gca aat ttt cat gtt ttt gca cac
2451

Gly His Lys Lys Asn Ala Gly Ile Ala Asn Phe His Val Phe Ala His
795 800 805 810

att gac cct tct aat cgc aag cta act atg ctt tac aag gtt cac cca
2499

Ile Asp Pro Ser Asn Arg Lys Leu Thr Met Leu Tyr Lys Val His Pro
815 820 825

ggg gct tgt gat cag agt ttt ggt att cat gtt gct gaa ttt gca aat
2547

Gly Ala Cys Asp Gln Ser Phe Gly Ile His Val Ala Glu Phe Ala Asn
830 835 840

ttt cca ccg agt gtt gtg gct ctg gct aga gaa aag gca tct gag ttg
2595

Phe Pro Pro Ser Val Val Ala Leu Ala Arg Glu Lys Ala Ser Glu Leu
845 850 855

gag gat ttc tct cct att gcc ata att cca aat gac att aaa gag gca
2643

Glu Asp Phe Ser Pro Ile Ala Ile Ile Pro Asn Asp Ile Lys Glu Ala
860 865 870

gct tca aaa cgg aag aga gaa ttt gac cgc cat gac gtg tct aga ggt
2691

Ala Ser Lys Arg Lys Arg Glu Phe Asp Arg His Asp Val Ser Arg Gly
875 880 885 890

act gcc aga gct cgg caa ttc tta cag gat ttc gct cag ttg cca ctg
2739

Thr Ala Arg Ala Arg Gln Phe Leu Gln Asp Phe Ala Gln Leu Pro Leu
895 900 905

gat aag atg gat cca aac gtg gtc agg caa aag ttg agc aaa atg aaa
2787

Asp Lys Met Asp Pro Asn Val Val Arg Gln Lys Leu Ser Lys Met Lys
910 915 920

acc gac ctg gag agg gat gca gtt gac tct cac tgg ctt cag caa ttc
2835

Thr Asp Leu Glu Arg Asp Ala Val Asp Ser His Trp Leu Gln Gln Phe
925 930 935

ttt taattcttca gattagaact atcttctatt ctgtgaagct tgggggggaa

2888
Phe

tgatacttat gggttttgtg gatataactt agcctatctg taaactttca tttaaactcct
2948

taccccaaac atgattctct gtaatcaggg gacttttgta tgcattctgt gttaatagta
3008

agcgttatct tatatgggtca aaaaa
3033

<210> 4

<211> 939

<212> PRT

<213> Nicotiana tabacum

<400> 4

Met Asn Glu Asn Leu Glu Glu Gln Ser Lys Leu Pro Glu Leu Lys Leu
1 5 10 15

Asp Ala Lys Gln Ala Gln Gly Phe Leu Ser Phe Phe Lys Thr Leu Pro
20 25 30

Lys Asp Pro Arg Ala Val Arg Leu Phe Asp Arg Arg Asp Tyr Tyr Thr
35 40 45

Ala His Gly Asp Asp Ala Thr Phe Ile Ala Glu Thr Tyr Tyr His Thr
50 55 60

Thr Thr Ala Leu Arg Gln Leu Gly Asn Arg Ala Asp Ala Leu Ser Ser
65 70 75 80

Val Ser Val Ser Arg Asn Met Phe Glu Thr Ile Ala Arg Asp Ile Leu
85 90 95

Leu Glu Arg Met Asp Arg Thr Leu Glu Leu Tyr Glu Gly Ser Gly Ser
100 105 110

Asn Trp Arg Leu Val Lys Ser Gly Thr Pro Gly Asn Leu Gly Ser Phe
115 120 125

Glu Asp Ile Leu Phe Ala Asn Asn Glu Met Gln Asn Ser Pro Val Ile
130 135 140

Ala Ala Leu Ala Pro Asn Phe Gly Gln Asn Gly Cys Glu Val Gly Leu
145 150 155 160

Gly Tyr Val Asp Ile Thr Lys Arg Val Leu Gly Leu Thr Glu Phe Leu
165 170 175

Asp Asp Ser His Phe Thr Asn Leu Glu Ser Ala Leu Val Ala Leu Gly
180 185 190

Cys Arg Glu Cys Leu Val Pro Ala Glu Thr Gly Lys Ser Ser Glu Tyr
195 200 205

Arg Pro Met Phe Asp Ala Ile Ser Arg Cys Gly Val Met Val Thr Glu
210 215 220

Arg Lys Lys Thr Glu Phe Lys Gly Arg Asp Leu Val Gln Asp Leu Gly
225 230 235 240

Arg Leu Val Lys Gly Ser Val Glu Pro Val Arg Asp Leu Val Ser Gly
245 250 255

Phe Glu Cys Ala Ser Gly Ala Leu Gly Cys Ile Leu Ser Tyr Ala Glu
260 265 270

Leu Leu Ala Asp Glu Ser Asn Tyr Gly Asn Tyr Thr Val Lys Gln Tyr
275 280 285

Asn Leu Asn Ser Tyr Met Arg Leu Asp Ser Ala Ala Met Arg Ala Leu
290 295 300

Asn Val Met Glu Ser Lys Ser Asp Ala Asn Lys Asn Phe Ser Leu Phe
305 310 315 320

Gly Leu Met Asn Arg Thr Cys Thr Ala Gly Met Gly Lys Arg Leu Leu
325 330 335

His Met Trp Leu Lys Gln Pro Leu Leu Asp Val Glu Glu Ile Asn Cys
340 345 350

Arg Leu Asp Leu Val Gln Ser Phe Val Glu Asp Ala Ala Leu Arg Gln
355 360 365

Asp Leu Arg Gln His Leu Lys Arg Ile Ser Asp Ile Glu Arg Leu Thr
370 375 380

His Asn Leu Glu Arg Lys Arg Ala Ser Leu Val His Val Val Lys Leu

385

390

400

Tyr Gln Ser Ser Thr Arg Val Pro Tyr Ile Lys Ser Val Leu Glu Arg
405 410 415

His Asp Gly Gln Phe Ala Thr Leu Ile Arg Glu Arg Tyr Ile Asp Ser
420 425 430

Leu Glu Lys Trp Ser Asp Asp Asn His Leu Asn Lys Phe Ile Gly Leu
435 440 445

Val Glu Thr Ser Val Asp Leu Asp Gln Leu Glu Asn Gly Glu Tyr Met
450 455 460

Ile Ser Ser Ala Tyr Asp Pro Asn Leu Ser Ala Leu Lys Asp Glu Gln
465 470 475 480

Glu Thr Leu Glu Arg Gln Ile His Asn Leu His Lys Gln Thr Ala Asn
485 490 495

Asp Leu Asp Leu Pro Ile Asp Lys Ser Leu Lys Leu Asp Lys Glu Thr
500 505 510

Gln Phe Gly His Val Phe Arg Ile Thr Lys Lys Glu Glu Pro Lys Val
515 520 525

Arg Lys Gln Leu Asn Ser His Tyr Ile Val Leu Glu Thr Arg Lys Asp
530 535 540

Gly Val Lys Phe Thr Tyr Thr Lys Leu Lys Lys Leu Gly Asp Gln Phe
545 550 555 560

Gln Lys Ile Val Glu Glu Tyr Lys Ser Cys Gln Lys Glu Leu Val Ala
565 570 575

Arg Val Val Gln Thr Ala Ala Ser Phe Ser Glu Val Phe Ala Gly Ile
580 585 590

Ala Gly Val Leu Ala Glu Leu Asp Val Leu Leu Ser Phe Ala Asp Leu
595 600 605

Ala Ala Ser Cys Pro Thr Pro Tyr Thr Arg Pro Asn Ile Ser Pro Pro
610 615 620

Asp Thr Gly Asp Ile Ile Leu Glu Gly Cys Arg His Pro Cys Val Glu
625 630 635 640

Ala Gln Asp Trp Val Asn Ser Ile Pro Asn Asp Cys Arg Leu Val Arg
645 650 655

Gly Glu Ser Trp Phe Gln Ile Ile Thr Gly Pro Asn Met Gly Gly Lys
660 665 670

Ser Thr Tyr Ile Arg Gln Val Gly Val Asn Val Leu Met Ala Gln Val
675 680 685

Gly Ser Phe Val Pro Cys Asp Asn Ala Thr Ile Ser Ile Arg Asp Cys
690 695 700

Ile Phe Ala Arg Val Gly Ala Gly Asp Cys Gln Leu Arg Gly Val Ser
705 710 715 720

Thr Phe Met Gln Glu Met Leu Glu Thr Ala Ser Ile Leu Lys Gly Ala
725 730 735

Thr Asp Arg Ser Leu Ile Ile Ile Asp Glu Leu Gly Arg Gly Thr Ser
740 745 750

Thr Tyr Asp Gly Phe Gly Leu Ala Trp Ala Ile Cys Glu His Ile Val
755 760 765

Glu Glu Ile Lys Ala Pro Thr Leu Phe Ala Thr His Phe His Glu Leu
770 775 780

Thr Ala Leu Ala Asn Lys Asn Gly Asp Asn Gly His Lys Lys Asn Ala
785 790 795 800

Gly Ile Ala Asn Phe His Val Phe Ala His Ile Asp Pro Ser Asn Arg
805 810 815

Lys Leu Thr Met Leu Tyr Lys Val His Pro Gly Ala Cys Asp Gln Ser
820 825 830

Phe Gly Ile His Val Ala Glu Phe Ala Asn Phe Pro Pro Ser Val Val
835 840 845

Ala Leu Ala Arg Glu Lys Ala Ser Glu Leu Glu Asp Phe Ser Pro Ile
850 855 860

196219.ST25.txt

Ala Ile Ile Pro Asn Asp Ile Lys Glu Ala Ala Ser Lys Arg Lys Arg
865 870 875 880

Glu Phe Asp Arg His Asp Val Ser Arg Gly Thr Ala Arg Ala Arg Gln
885 890 895

Phe Leu Gln Asp Phe Ala Gln Leu Pro Leu Asp Lys Met Asp Pro Asn
900 905 910

Val Val Arg Gln Lys Leu Ser Lys Met Lys Thr Asp Leu Glu Arg Asp
915 920 925

Ala Val Asp Ser His Trp Leu Gln Gln Phe Phe
930 935

<210> 5
<211> 160
<212> DNA
<213> Nicotiana tabacum

<220>
<221> unsure
<222> (1)..(2)
<223> "n" at positions 1 and 2 can be A, C, G, or T

<400> 5
nnagagaatc ttctctagct ccccgccatt ctctttcccg ccaaccacaca tccctccatt
60

ttccattac tctataaaat cctttgcttt tcatttctac tgcagaaaag ttaaaagaaa
120

aaaaaaaaatg aatgaaaatt tggaggaaca gagcaagctt
160

<210> 6
<211> 163
<212> DNA
<213> Nicotiana tabacum

<220>
<221> unsure
<222> (1)..(2)
<223> "n" at positions 1 and 2 can be A, C, G, or T

<220>
<221> unsure
<222> (141)..(141)
<223> "n" at position 141 can be A, C, G, or T

<400> 6
 nnaagagaat ctctcttagc tccccgcat tctctttccc gccaacccac atccctccat
 60

tttcccatta ctctataaaa tcctttgctt ttcatttcta ctgcagaaaa gtttaaagaa
 120

aaaaaaaaat gaatgaaaat ntggaggaac agagcaagct tca
 163

<210> 7
 <211> 163
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (1)..(2)
 <223> "n" at positions 1 and 2 can be A, C, G, or T

<400> 7
 nnagagaatc ttctctagct ccccgccatt ctctttcccg ccaaccaca tcctccggt
 60

ttccattac tctataaaat cctttgcttt tcattttctac tgcagaaaag ttaaaagaaa
 120

aaaaaaaaaa tgaatgaaaa tttggaggaa cagagcaagc ttc
 163

<210> 8
 <211> 165
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (1)..(2)
 <223> "n" at positions 1 and 2 can be A, C, G, or T

<220>
 <221> unsure
 <222> (161)..(161)
 <223> "n" at position 161 can be A, C, G, or T

<400> 8
 nnttctctag ctccccgcca ttctctttcc cgccaatcca aatccctcca ttttctcta
 60

ttttccatt actctataaa atcctttcct tttcatttct acagcataaa ggttaaagaa
 120

aaaaaaatga atgaaaattt ggaggaacag agcaagttca ncgaa

165

<210> 9
 <211> 166
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (165)..(166)
 <223> "n" at positions 165 abd 166 can be A, C, G, or T

<400> 9
 agagaatctt ctctagctcc ccgccattct ctttcccgcc aatccaagtc cctccatttt
 60

cctctatttt ccctactctc tataaaatcc tttccttttc atttctacag cataaagggt
 120

aaagaaaaaa aaatgaatga aaatttggag gaacagagca agctnn
 166

<210> 10
 <211> 166
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (1)..(2)
 <223> "n" at positions 1 and 2 can be A, C, G, or T

<400> 10
 nnagagaatc ttctctagct ccccgccatt ctctttcccg ccaaccaca tccctccatt
 60

ttcccattac tctataaaat cctttgcttt tcattttctac tgcagaaaag ttaaaagaaa
 120

aaaaaaaaatg aatgaaaatt tggaggaaca gagcaagctt caatcg
 166

<210> 11
 <211> 166
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (1)..(2)
 <223> "n" at positions 1 and 2 can be A, C, G, or T

<220>

<221> unsure
 <222> (157)..(158)
 <223> "n" at positions 157 and 158 can be A, C, G, or T

<400> 11
 nnagagaatc ttctctagct ccccgccatt ctctttcccg ccaaccaca tccctccatt
 60

ttcccattac tctataaaat cctttgcttt tcatttctac tgcagaaaag ttaaaagaaa
 120

aaaaaaaaatg aatgaaaatt tggaggaaca gagcaanntt caatcg
 166

<210> 12
 <211> 165
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (1)..(2)
 <223> "n" at positions 1 and 2 can be A, C, G, or T

<400> 12
 nnagagaatc ttctctagct ccccgccatt ctctttcccg ccaaccaca tccctccatt
 60

ttcccattac tctataaaat cctttgcttt tcatttctac tgcagaaaag ttaaaagaaa
 120

aaaaaatgaa tgaaaatttg gaggaacaga gcaagcttca atcga
 165

<210> 13
 <211> 314
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (222)..(222)
 <223> "n" at position 222 can be A, C, G, or T

<400> 13
 gatatacta gtgattcttt gcaatgaaag ttgcatcatc tccatgagca gtataatagt
 60

cccgacgatc aaagaggcga actgccctag ggtccttggg tagggttttg aaaaatgaga
 120

gaaatccttg agcttgctta gcatcaagtt taagctcagg aagcttgctc tgttcctcca
 180

196219.ST25.txt

aaatcgaatt cccgcggccg ccatggcggc cgggagcatg cnacgtcggg cccaattcgc
240

cctatagtga gtcgtattac aattcactgg cgcgcgtttt acaacgtcgt gactgggaaa
300

accctggcgt tacc
314

<210> 14
<211> 314
<212> DNA
<213> Nicotiana tabacum

<400> 14
gatataccta gtgattcttt gcaatgaaag ttgcatcatc tccatgagca gtataatagt
60

cccgacgatc aaagaggcga actgccctag ggtccttggg cagggttttg aagaatgaga
120

gaaatccttg agcttgctta gcatccagtt taagctcggg aagcttgctc tgttcctcca
180

aaatcgaatt cccgcggccg ccatggcggc cgggagcatg ccgacgtcgg gcccaattcg
240

ccctatagtg agtcgtatta caattcactg gccgcgtttt tacaacgtcg tgactgggaa
300

aaccctggcg ttac
314

<210> 15
<211> 311
<212> DNA
<213> Nicotiana tabacum

<400> 15
atatcactag tgattctttg caatgaaagt tgcacatct ccatgagatg tataatagtc
60

ccgacgatca aagaggcgaa ctgccctagg gtccttgggc agggttttga agaagagag
120

aaatccttga gcttgcttag catccagttt aagctcggga agcttgctct gttcctccaa
180

aatcgaattc ccgcggccgc catggcggcc gggagcatgc gacgtcgggc ccaattcgcc
240

ctatagtga tcgtattaca attcactggc cgcgcgtttt caacgtcgtg actgggaaaa
300

ccctggcggt a
311

<210> 16
 <211> 214
 <212> DNA
 <213> Nicotiana tabacum

<400> 16
 gttaaaccct aattcggttaa atgttttatt acattttcag aagtttattc ttacaagtct
 60

tttctagctc taatttttta ttattttactt tttctcttca tattatttat tgtgtttaat
 120

aaatagaggg ttcattattag ttgttcagct gatttaggga tttaaccgta gtttgattga
 180

ttgaaatttg ttaccgtgaa tggttttggt ttag
 214

<210> 17
 <211> 223
 <212> DNA
 <213> Nicotiana tabacum

<400> 17
 gtaaaaccct aattctttga atgttttatt acattctcag aagtttattc ttacaagctt
 60

ttttctagtt ctaatttttt ttattttata gtttttctct ttatattggt tactgtgttt
 120

aataaatgga tattgatggt tcatattagc ggttcaactg atttggggat ttaactgtag
 180

tttgattgat tgatatttgt tattgtgaat ggtcttggtt tag
 223

<210> 18
 <211> 222
 <212> DNA
 <213> Nicotiana tabacum

<400> 18
 gtaaaaccct aattctttga atgttttatt acattctcag aagtttattc ttacaagctt
 60

ttttctagtt ctaatttttt ttattttata gtttttctct ttatattggt tactgtgttt
 120

aataaatgga tattgatggt tcatattagc ggttcaactg atttggggat ttaactgtag
 180

tttgattgat gatatttgtt attgtgaatg gttttgtttt ag
 222

<210> 19

<211> 107
 <212> DNA
 <213> Nicotiana tabacum

<400> 19
 gtaacttttt catattattc attctgttta aatagttatt gcaccttcac ttgtagagaa
 60

aattgctcgg cggttcactt aatagagaac ttttgatttt tttgcag
 107

<210> 20
 <211> 105
 <212> DNA
 <213> Nicotiana tabacum

<400> 20
 gtaacttttt catattattc attctgttta aatagttatt gcaccttcac ttgtagagaa
 60

aattgttagt cgggttgctt aatagagaac tctttttttt tgcag
 105

<210> 21
 <211> 106
 <212> DNA
 <213> Nicotiana tabacum

<220>
 <221> unsure
 <222> (11)..(16)
 <223> "n" at positions 11-16 can be A, C, G, or T

<400> 21
 gtaaaactttt nnnnnnattc attctgttca aacggttatt gcaccttcac ttgtagagaa
 60

aattgttagt cgggttgctt aatagagaac tctttttttt tgcag
 106

<210> 22
 <211> 5
 <212> PRT
 <213> MutS consensus sequence

<400> 22

Thr Gly Pro Asn Met
 1 5

<210> 23
 <211> 5
 <212> PRT
 <213> MutS consensus sequence

<400> 23

Phe Ala Thr His Tyr
 1 5

<210> 24

<211> 20

<212> DNA

<213> oligonucleotide primer

<400> 24

gtaacagggc ctaacatggg
 20

<210> 25

<211> 19

<212> DNA

<213> oligonucleotide primer

<400> 25

ggaagtgagt agcaaacag
 19

<210> 26

<211> 19

<212> DNA

<213> oligonucleotide primer

<400> 26

caggccctaa catgggtgg
 19

<210> 27

<211> 20

<212> DNA

<213> oligonucleotide primer

<400> 27

aatgaaatgc aagattctcc
 20

<210> 28

<211> 20

<212> DNA

<213> oligonucleotide primer

<400> 28

gaagcttgct ctgttcctcc
 20

<210> 29

<211> 17

<212> DNA

<213> oligonucleotide primer

<220>
 <221> misc_feature
 <222> (3)..(3)
 <223> "n" at position 3 can be A, C, G, or T

<220>
 <221> misc_feature
 <222> (6)..(6)
 <223> "n" at position 6 can be A, C, G, or T

<220>
 <221> misc_feature
 <222> (9)..(9)
 <223> "n" at position 9 can be A, C, G, or T

<400> 29
 acnggncna ayatggg
 17

<210> 30
 <211> 17
 <212> DNA
 <213> oligonucleotide primer

<220>
 <221> misc_feature
 <222> (9)..(9)
 <223> "n" at position 9 can be A, C, G, or T

<220>
 <221> misc_feature
 <222> (12)..(12)
 <223> "n" at position 12 can be A, C, G, or T

<400> 30
 tgyaartgng tncgraa
 17

<210> 31
 <211> 19
 <212> DNA
 <213> oligonucleotide primer

<400> 31
 caggccctaa catgggtgg
 19

<210> 32
 <211> 6
 <212> PRT

<213> MSH2 consensus sequence

<400> 32

Asp Tyr Tyr Thr Ala His
1 5

<210> 33

<211> 20

<212> DNA

<213> oligonucleotide primer

<400> 33

gattattata cagctcatgg
20

<210> 34

<211> 6

<212> PRT

<213> MSH2 consensus sequence

<400> 34

Met Trp Leu Lys Gln Pro
1 5

<210> 35

<211> 17

<212> DNA

<213> oligonucleotide primer

<400> 35

atgtggctga aacaacc
17

<210> 36

<211> 22

<212> DNA

<213> oligonucleotide primer

<400> 36

cttatgtcca ttgtctccat tc
22

<210> 37

<211> 20

<212> DNA

<213> oligonucleotide primer

<400> 37

gtccattgtc tccattcttg
20

<210> 38

<211> 20

<212> DNA
<213> oligonucleotide primer

<400> 38
gcaccccaaa gcgcctgatg
20

<210> 39
<211> 23
<212> DNA
<213> oligonucleotide primer

<400> 39
ctgatgcaca ttcgaacca gag
23

<210> 40
<211> 22
<212> DNA
<213> oligonucleotide primer

<400> 40
acatatagtt caagagtacg gt
22

<210> 41
<211> 22
<212> DNA
<213> oligonucleotide primer

<400> 41
gctattgttt caaacatggt tc
22

<210> 42
<211> 22
<212> DNA
<213> oligonucleotide primer

<400> 42
ttggaggaac agagcaagct tc
22